

Amendments to the Claims

The listing of claims will replace all prior versions, and listings of claims in the application.

1. (currently amended) A method for printing on a wafer, comprising:
 - (a) calculating a polarization distribution based upon a simulation of a pattern to be printed on the wafer;
 - ~~(a)(b)~~ polarizing light according to ~~a predetermined~~ the calculated polarization pattern distribution to produce a ~~single-polarized~~ exposure beam ~~having a polarization angle that varies across a cross-section of the beam relative to a center point in the beam;~~
 - ~~(b)(c)~~ outputting the polarized exposure beam along an optical path toward a mask having the pattern to be printed on the wafer;
 - ~~(e)(d)~~ illuminating the mask in the optical path with the polarized exposure beam to produce an image in the exposure beam; and
 - ~~(d)(e)~~ exposing a photoresist layer on the wafer in the optical path with light in the exposure beam.

2. (currently amended) The method of claim 1, wherein said step ~~(a)-(b)~~ further comprises producing the polarized exposure beam according to a radial polarization pattern.

3. (currently amended) The method of claim 1, wherein said step ~~(a)~~(b) further comprises producing the polarized exposure beam according to a tangential polarization pattern.
4. (currently amended) The method of claim 1, wherein said step ~~(a)~~(b) further comprises producing the polarized exposure beam according to a custom polarization pattern.
5. (currently amended) The method of claim 1, wherein said step ~~(a)~~(b) further comprises producing polarized quadrupole illumination.
6. (currently amended) The method of claim 1, further comprising:
pre-polarizing light at an illumination source prior to said ~~pattern~~-polarizing step
~~(a)~~(b).
7. (currently amended) The method of claim 1, wherein said step ~~(e)~~(d) comprises illuminating a mask to produce an image that includes contact holes.
8. (currently amended) The method of claim 1, wherein said step ~~(d)~~(e) occurs in a liquid.

9. (previously presented) The method of claim 1, wherein the mask is at least one of the group consisting of: chromeless phase-shift mask, attenuating phase-shift mask, and alternating phase-shift mask.
10. (previously presented) The method of claim 1, wherein the mask is a binary mask.
11. (currently amended) A method of printing on a wafer, comprising:
- (a) calculating a polarization distribution based upon a simulation of a pattern to be printed on the wafer;
 - ~~(a)~~(b) polarizing light according to a ~~predetermined~~ the calculated polarization ~~pattern-distribution~~ to produce a single-polarized exposure beam ~~having a polarization angle that varies across a cross section of the beam relative to a center point in the beam;~~
 - ~~(b)~~(c) outputting the polarized exposure beam along an optical path;
 - ~~(c)~~(d) illuminating a chromeless phase-shift mask in the optical path with the polarized exposure beam to produce an image in the exposure beam; and
 - ~~(d)~~(e) exposing a negative photoresist layer on the wafer in the optical path with light in the exposure beam.
12. (currently amended) A method of printing on a wafer, comprising:
- (a) calculating a polarization distribution based upon a simulation of a pattern to be printed on the wafer;

(a)(b) polarizing light according to a ~~predetermined~~ the calculated polarization ~~pattern-distribution~~ to produce a single-polarized exposure beam having a polarization angle that varies across a cross-section of the beam relative to a center point in the beam;

(b)(c) outputting the polarized exposure beam along an optical path;

(c)(d) illuminating an attenuating phase-shift mask in the optical path with the polarized exposure beam to produce an image in the exposure beam; and

(d)(e) exposing a positive photoresist layer on the wafer in the optical path with light in the exposure beam.

13. (currently amended) A method of printing on a wafer, comprising:

(a) calculating a polarization distribution based upon a simulation of a pattern to be printed on the wafer;

(a)(b) polarizing light according to a ~~predetermined~~ the calculated polarization ~~pattern-distribution~~ to produce a single-polarized exposure beam having a polarization angle that varies across a cross-section of the beam relative to a center point in the beam;

(b)(c) outputting the polarized exposure beam along an optical path;

(c)(d) illuminating a binary mask in the optical path with the polarized exposure beam to produce an image in the exposure beam; and

(d)(e) exposing a positive photoresist layer on the wafer in the optical path with light in the exposure beam.

14. (currently amended) A method of printing on a wafer, comprising:
- (a) illuminating a phase-shift mask with pre-polarized light to produce an image in the pre-polarized light;
 - (b) outputting the pre-polarized light from the phase-shift mask along an optical path;
 - ~~(b)~~(c) shaping the pre-polarized light with a pattern polarizer in a projection optic in the optical path to produce an exposure beam, wherein the pre-polarized light is shaped according to ~~a predetermined polarization pattern and intensity pattern, wherein the polarization pattern has a polarization angle that varies across a cross-section of the polarization pattern relative to a center point in the polarization pattern~~ a polarization distribution calculated based upon a simulation of a pattern to be printed on the wafer; and
 - ~~(c)~~(d) exposing a photoresist layer on the wafer in the optical path with the exposure beam.
15. (currently amended) A lithography system, comprising:
- (a) a simulator that calculates a polarization distribution of an exposure beam for a particular mask pattern;
 - ~~(a)~~(b) an illumination source that emits illumination light along an optical path;
 - ~~(b)~~(c) a pattern polarizing device that converts the illumination light from the illumination source into ~~an~~ the exposure beam ~~with a predetermined polarization pattern having the calculated polarization distribution~~ and outputs the exposure beam into the optical path, ~~wherein the polarization pattern has a polarization~~

~~angle that varies across a cross-section of the polarization pattern relative to a center point in the polarization pattern;~~

~~(e)~~(d) a mask that produces ~~an image~~ the particular mask pattern in the exposure beam, wherein the mask includes contact hole features having a pitch; and

~~(d)~~(e) a projection optic that relays the exposure beam for printing on a wafer.

16. (cancelled)

17. (original) The lithography system of claim 15, wherein said illumination light is pre-polarized illumination light, and wherein said pattern polarizing device is a polarizer.

18. (original) The lithography system of claim 15, wherein said illumination light is unpolarized illumination light, and wherein said pattern polarizing device is a polarizer.

19. (currently amended) The system of claim 15, further comprising:

~~(e)~~(f) a wafer configured to be exposed by the exposure beam.

20. (original) The lithography system of claim 19, further comprising a liquid filling a space between said projection optic and said wafer.

21. (original) The lithography system of claim 15, wherein said pattern polarizing device is included in the projection optic.

22. (currently amended) The lithography system of claim 15, wherein said ~~predetermined polarization pattern~~ calculated polarization distribution is a radial polarization pattern.

23. (currently amended) The lithography system of claim 15, wherein said ~~predetermined polarization pattern~~ calculated polarization distribution is a tangential polarization pattern.

24. (currently amended) The lithography system of claim 15, wherein said ~~predetermined polarization pattern~~ calculated polarization distribution is a custom polarization pattern.

25. (original) The lithography system of claim 15, wherein said mask is one of the group consisting of: a chromeless phase-shift mask, an attenuating phase-shift mask, a binary mask, and an alternating phase-shift mask.

26. (cancelled)

27. (currently amended) A method of producing contact holes on a wafer, comprising:

(a) calculating a polarization distribution of an exposure beam through simulation for a particular contact hole pattern;

- ~~(a)(b)~~ producing a polarized illumination beam ~~having a polarization angle that varies across a cross section of the beam relative to a center point in the beam,~~
wherein the illumination beam has the calculated polarization distribution;
- ~~(b)(c)~~ illuminating a mask with the polarized illumination beam to create an exposure beam, wherein said mask produces ~~contact hole features~~ the particular contact hole pattern having a pitch in the exposure beam; and
- ~~(e)(d)~~ exposing a wafer with the exposure beam.

28. (currently amended) The method of claim 27, wherein said step ~~(b)(c)~~ further comprises illuminating a phase-shift mask.

29. (currently amended) The method of claim 27, wherein said step ~~(a)(b)~~ further comprises producing a radially polarized illumination beam.

30. (currently amended) The method of claim 27, wherein said step ~~(a)(b)~~ further comprises producing a tangentially polarized illumination beam.

31. (currently amended) The method of claim 27, wherein said step ~~(a)(b)~~ further comprises producing a custom polarized illumination beam.